United States Department of the Interior

FISH AND WILDLIFE SERVICE

In reply refer to:

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Memorandum

APR 10 2018

To: File

From: Bill Poytress, Program Manager, Red Bluff Fish and Wildlife Office, USFWS

Subject: Genetic-based revisions to brood year 2017 winter and spring Chinook passage and production estimates in an effort to improve the accuracy of Red Bluff juvenile monitoring estimates.

During the fall of 2017, we fin clipped and had genetically analyzed juvenile winter and spring Chinook designated by length-at-date criteria to verify run designation as part of two genetic sampling projects. These projects are known as the "Improving Vital Rates Estimation Using Parentage-Based Mark Recapture Methods" and the "Central Valley Salmonid Coordinated Genetic Monitoring Project". Both projects have been conducted for two consecutive years (BY 2016 and BY 2017). Genetic analyses have been conducted in prior years (BY 2015 and BY 2016) on a small sample of fish sacrificed for histological analyses (n=80/yr) by Dr. Scott Foott of the California Nevada Fish Health Center during the latter half of the drought.

Using the data gathered from standardized genetic sampling (fin clips) of up to 10 winter and 10 spring Chinook salmon collected daily, we were able to evaluate the accuracy of our field-based length-at-date (LAD) run assignments used to generate the brood year 2017 winter and spring Chinook passage and production estimates. The LAD run assignment method has been the standard model used by the Red Bluff Fish and Wildlife Office for run assignment at the Red Bluff Diversion Dam rotary-trap sampling site since 1995. Genetic samples were taken from 2 out of 4 traps per day in a standardized rotation. For instance, when fish numbers were adequate in all traps, we would sample 10 of each run from 2 traps on day 1 and then do the same for the other 2 traps on day 2. During periods of low winter and/ or spring Chinook abundance, fin clips were collected from 3 or up to 4 traps per day to meet the targeted number of fin clips per day. According to LAD criteria used for initial assignment, the percentage of fish sampled on any given day varied from between 1% and 80% throughout the mixed run distribution period (mid-October into December).

Reviewing the genetic run analysis data identified a pretty significant break point as to when winter-run migration subsided and genetic spring-run appeared in the system. This break point occurred following the first fall storm event that produced increased flow and turbidity. Of the genetic samples (n = 273) taken between October 16 and November 30, 2017, (initially assigned to spring Chinook according to length-at-date criteria) all of those prior to November 20, 2017 were genetically identified as winter Chinook with one exception. In essence, genetically identified winter Chinook were incorrectly assigned to spring Chinook using LAD criteria for a period of 34 days. As a result, during the latter half of October according to LAD criteria, spring Chinook juvenile estimates far exceeded winter Chinook for the first time in 20 years of monitoring (see original biweekly reports) resulting in

substantial negative bias to winter Chinook estimates and concurrent positive bias to spring Chinook estimates. The genetic data indicated the need to revise our passage/production estimates for the two runs to more accurately portray juvenile passage and production in 2017.

Independently collected adult data and information from the California Department of Fish and Wildlife (CDFW) provided additional support for the need to revise the winter and spring Chinook juvenile passage/production estimates. In the summer and fall of 2017, the adult winter Chinook carcass survey data clearly indicated later spawning of adults when compared to average estimated spawn timing from the prior 16 years (Figure 1). Sacramento River water temperature analyses conducted by CDFW coupled with winter Chinook redd data estimated the last emergence timing of winter Chinook fry would occur in early November of 2017. Other survey work of adult carcass and redd survey data collected by CDFW and USFWS indicated that spring-run Chinook adults upstream of our sample site in the mainstem Sacramento River and tributaries numbered in the handfulls. These data, when combined, provided evidence that the substantial numbers of spring Chinook juveniles we estimated passage of using LAD criteria was impossible given the minimal number of spring Chinook adults that returned during the fall of 2017.

In conclusion, by taking multiple data sources into account as well as consultations with the Genetics Project Work Team and the Winter Chinook Project Work Team (IEP PWT's), I felt it necessary to reassign fish that, according to LAD criteria, fell into the spring-run category to the winter-run category based on their genetic assignments. I used the genetic data to determine that the period of October 16 through November 18, 2017 was appropriate to reassign all spring-run fish to winter-run. Biweekly reports' passage data for both runs have been revised for the period of October 8, 2017 through March 25, 2018 to incorporate the revised estimates. These data will be used as the official passage and production estimates and be detailed in an annual report that will be completed in the coming year. Both sets of reports have been placed on the Red Bluff Fish and Wildlife Office's website biweekly report page for 2017 and 2018 for interested parties to compare pre- and post-genetic correction passage estimates for each run.

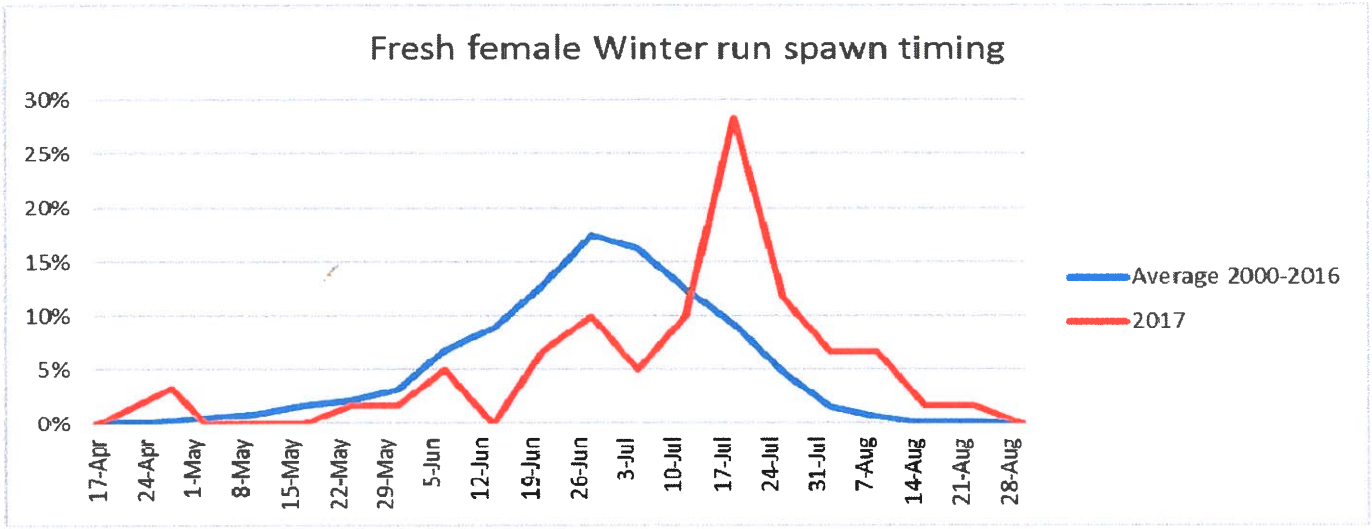

Figure 1. Winter Chinook spawning temporal distribution comparison on 2017 data to average of 2000-2016 data. Data based on carcass recoveries and provided by CDFW.